APPENDIX – IV-A

Format for Outline (Synopsis) of Proposed Research work

(to be supplied in four copies)

(Reference Ord. 124.11)

1- **Name of Scholar** (In English) : **Farzana Jafri**

(In Hindi) : फ़रज़ाना जाफरी

2- **Title of Research Work** - (In English) : **Study of Mammalian Fauna of Hamirgarh Ecopark, Bhilwara, Rajasthan**.

(In Hindi) : हमीरगढ ईकोपार्क,भीलवाड़ा,राजस्थान के स्तनधारी प्राणियो का अध्ययन.

3- Location :

a Institution/Department where the work is to be done : Department of Zoology M.L.V. Govt. College, Bhilwara

b Geographical area of Investigation, (if any) : Ecopark,Hamirgarh, Bhilwara

The Ecopark wildlife reserve at Hamirgarh where the proposed study of Mammalian fauna, shall be carried out is situated in Hamirgarh village of Suwana tehsil of Bhilwara district in Rajasthan. It is situated at an altitude of 425 m above the sea level between 25°11'0" North & 74°.38' 0" & East. It is spread in the 567 hectares and it was declared reserved forest by Govt. of Rajasthan on 21-06-2012.

It is located about 20 km towards south from headquarter Bhilwara and situated on four lane highway NH-79 which gives a good enough opportunity to the general public to have a glance of 'wildlife' and their habitat present in the Ecopark wild life reserve.

The Ecopark is home to various kinds of flora and fauna. One can observe and study a variety of wildlife (fauna) like Fox (*Vulpes bengalensis*), Jackal (*Canis acereus*), Nilgai (*Boselaphus tragocamelus*), Chinkara (*Gazella bennetti*), Grey monkey (Hanuman Langur) and many more. The configuration of land at Ecopark and Hamirgarh village where this park is situated includes mountains, hills, flat areas, small riverlets, nallas and valleys of different

depths. The forest at this wildlife park constitutes of many types of hybrid species like *salon, gurjan , dhavda, khair, tendu,patta, kohala, dhak, kherni* and various types of wild grass.
The temperature as in the state of Rajasthan itself remains high in summer and very low in winter. Winter is from December to February and summer is from March to June. The monsoon is from July to September every year. The state of Rajasthan though being a dry state with less rainfall generally but the village of Hamirgarh and Ecopark sanctuary gets more than average rainfall due to its forest vegetation. There are few small rivers and rivelets flowing through the reserve and the soil has good enough water. This Ecopark wild reserves comes under Bhilwara forest range. The Eco park is so designed (566.15 hectare area) that these mammals can be visualised easily. Various walking paths are constructed like Jackal path for observing Jackal, Chinkara path for chinkara and many more.

4- Introduction, Importance of proposed investigation, Objective.

Mammals are the dominant life form on this planet. There are 4260 species of mammals known on planet Earth at the moment and many more are still being found every year.
Whales, pigs, horses, cattle, sheep, dogs, cats, rats and human beings are examples of mammals. The Blue whale (*Balaenoptera musculus*) is the largest living mammal today. The tallest mammal on the planet is giraffe (*Giraffa Camelopardalis*) .The smallest animal is a bat from Thailand. The cheetah (*Acinonyse jubatus*) is the fastest animal on land having a speed of 96 km/hr and the fastest animal in water is Killer Whale (*Orcinus orca*) having speed of 55 km/hr. The fastest mammal in the air is the Brown Bat (*Eptesicus fuscus*) with a flight of 25 km/hr.
There are 6 characteristics of mammals-

1- It can produce milk (if it is a female). The milk is produced by the modified sweat glands called Mammary Glands.
2- Mammals have hair either at early stage or later stage.
3- The lower jaw in mammals is a single bone on either side.
4- The mammal middle ear contains 3 bones. Stapes, Incus, Mallens.
5- In mammals the main artery leaving the heart curves to the left whereas in birds it curves to the right.
6- Mammals have a diaphragm; which is a sheet of muscles and tendon that separates the body cavity into two sections. No other animal has a diaphragm.

So we can say mammals are part of the beauty and diversity of life that makes this world so good to live in. But at the same time we should remember that many mammal species are on

the verge of extinction. So far 86 species and 24 sub species of mammals have become extinct. Apart from these, 241 taxa of mammals are currently on the IUCN critically endangered list and further 776 are classed as vulnerable. So a great necessity arises to conserve the remaining species of mammals.

Importance of proposed investigation:

The mammalian fauna diversity as we know acts as an excellent bio-indicator for the quality of the ecosystem and health of the environment. Moreover, they are important components of food chains of the Ecosystem.

It has been proved many a times that some mammals are good indicators for assessing forest conditions because they are very sensitive to ecological and climate change. They are abundant in number and easy to observe, so that a quantitative analysis can be performed, which becomes an important reason for this study.

Small mammals such as rodents are very important to the ecosystem as they serve as prey for small and medium carnivores (Shankar 2003).

Furthermore, each species of mammalian fauna on the planet is important for the continuation of the food chain. Mammalian fauna and their habitat have numerous benefits for the existence and survival of humans as well as flora and fauna. Survival of these Mammalian fauna is dependent on the survival of forests as they are home to the millions of species of plants, insects, reptiles, birds, mammals, amphibians etc. If there is lack of trees and grasslands it will lead to lack of food for herbivores. If the herbivores are unable to survive it will result in the shortage of food for the carnivores. Thus by destruction of forest and habitat the food web will be destroyed.

Also, these mammalian fauna are not only important for the survival of food chain. They are important for the eco-economic activities like tourism and for social causes and public awareness about the wildlife protection and the economics of the local flora and fauna as well. As far as Ecopark at Hamirgarh is concerned not much research work has been done on mammalian fauna earlier which makes a good enough sense to pursue further studies on these relevant topics of mammalian fauna. So this is the very basis of study of mammalian fauna at Ecopark Hamirgarh, Bhilwara.

Objectives:

1. Study of mammalian fauna at Ecopark, Hamirgarh.
2. Study of natural habitats of mammalian fauna at Ecopark, Hamirgarh, Bhilwara
3. Study of various threats to mammalian fauna.

4. Effects of Ecotourism and Anthropogenic pressures on mammalian fauna.
5. Creating awareness about wildlife conservation to the general public.

5- Review (Work already done on the subject of proposed Research Study)

After making a considerable study of various theses, papers and journals, it was established that an extensive body of literature is available on mammalian fauna which can be of immense help for future research in the concerned and related fields. Here at the study area at Ecopark, Hamirgarh, there is specific presence of Indian gazelle (Chinkara), nilgai, wild boar, Grey langur etc. which are to be studied for their habitat, food habits, activity pattern, abundance, distribution pattern, reproduction and their conservation.

Various studies based on research papers and reports by eminent writers was carried out on chinkara population in high chinkara density areas and the results revealed first by Rahmani (1997) suggested that its density was 0.74 / km^2 , whereas Kankane (2000) reported a slight increasing trend with 0.89 /km^2 and Dhook (2002) reported 1.24 km^2 and again by Dhookia (2007) reported 0.76 km^2, a sharp decline of 38%.

The reason behind this decline was estimated to be the habitat loss and poaching and predation by feral dogs. Sankar and Acharya, (2004)estimated that breeding in the Indian Jackal can occur at any time of the year, whereas fawning was observed throughout the year, with a peak during January to April as recorded by Schaller (1967). Raman (1990) estimated a mean monthly mortality of 9.7% in Guindy National Park. Pariwakam (2006) found it to be 66% over a six- week study period in Bandipur using photographic capture-recapture method. Prerna (2013) quantified the predation on ungulates by Jackals.

Growth in the numbers of Blue Bull (Nilgai) and wild boar is due to their adaptation to feeding in crop fields Changani, (2004). Animals like sambhar, chinkara, on the other hand cannot adapt themselves to crop field and are mainly grazers depending on the ground food.

A number of factors such as the quality and abundance of food items, their distribution in time and space, the size and composition of the foraging group and population density may influence the ranging behaviour of primates (Dunbar 1988). Human influences (Wada 1983) and habitat disturbances (Johns 1983) also strongly affect home ranges, size and ranging behaviour.

In the Indian Context, one of the well-studied Cervid in the tropical grassland is the Hog-deer (*Axis pornicus*). Dhungel *et.al.* (1991) studied the ecology of this species in Royal Chitwan National Park, Nepal during 1981-83 to obtain information on the morphological

features, sex and age ratios, group size, reproduction, mortality, movement, habitat use, food habits and behaviour.

Tak *et.al.* (1981) studied hog deer at Dhikala, Jim Corbett National Park, from January 1977 to June 1979. He found that their herd size varied from 2 to 35 individuals. It preferred grasslands along the river beds and open grassy land.

Martin (1977) studied status and ecology of Barasingha (*Rucervus duvacelii branderii*) in Kanha National Park (Madhya Pradesh). The population was found congregating in that part of its annual home range which had maximum water bodies. Barasingha showed "diurnal" activity patterns during cool and dry season. Feeding was done mostly around sunrise and sunset and did travelling during the day.

Gopal (1995) studied biology and ecology of hard ground "Barasingha" in Kanha National park, Madhya Pradesh. He made detailed investigation of their various aspects viz morphology, anatomy, physiology, karyotype analysis and population dynamics. His study confirmed the fact that Barasingha is a large sized deer with well developed, shallow, pre-orbital glands. Like other ungulates, the Barasingha has also developed "anti-predator strategies" to save itself from predators.

Sankar (1994) studied ecology of chital (*Axis axis*) in Sariska Tiger Reserve. Chital fed exclusively on grass during monsoon, on fallen leaves during winter and green grass sprouts during summers.

Chakarvarty (1991) studied the habitat use by radio instrumented chital in Sariska Tiger Reserve. He found that the distance moved by the animal during different time of day varied both in winter and summer. It was more active during day in winter. Its summer home range was smaller than its winter home range.

Raman *et.al.* (1996) studied the population structure, density and seasonal habitat use and feeding habits of chital in Guindy National Park in Tamil Nadu using the line transects during 1991-92. It was found to be stable Bhat (1993) studied habitat use by chital in Dhaul khan, Rajaji National Park and found that density of chital is same in hills and plain in winter and summer.

Schaller (1967) studied that the distribution of chital (Axis axis) in their native range is sporadic throughout the Indian subcontinent from Himalayas in the north to Kerela and Tamil Nadu in the south and from Assam in the east up to Gir forest in the west. Roberts (1977) searched the fact that chital was once widely distributed in Pakistan but went extinct due to hunting and poaching. Karanuth and Sunquist (1992) confirmed that chital plays a keystone

species role by attaining higher densities. They reported 51 chital per km^2 in moist deciduous forests of Nagarhole National Park.

Similarly Khan *et.al.* (1996) estimated 50.8 chital per km^2 in dry deciduous forest of Gir, Gujrat, whereas in a previous study Mathur (1991) reported a very high abundance of chital (>100 chital per km^2) in Kanha National Park, which shows that chital can attain higher densities in favourable ecological conditions.

Mishra (2001) stated and confirmed that a rapid industrialization and change in land use has taken a big toll on traditional grazing pastures and unprotected forests. According to Renecker and Hudson (1993) those species attain higher densities and usually forms groups to protect themselves against predators. Chital fits into this category as it is found generally in open forests and forests edges which is confirmed by Graff & Nichols (1966) and Schaller (1967).

The group sizes in ungulates are a functions of the social behavior as studied by Jarman (1974) and Robins (1975) explained the role of ambient temperature on the daily activity patterns of ungulates. As also mentioned by Lucas (1987), Bunnell and Harestad (1989) and Dove (1996) that the time spent in various activities is influenced by energy requirement and the constraints they encounter i.e. food distribution, predators and thermal stress. Shankar Ram (1997) studied the factors influencing seasonal and monthly changes in the group size of chital in south India. Journal of Bio-sciences, 22(2):203-218.

Gaikwad and Narwade established in their study of the status of chinkara (*Gazelle bennetti*) at Mayureshwar Wildlife Sanctuary in Pune, Maharashtra that these mammals were facing threats from habitat depletion, vehicular movements and development projects.

Singh *et.al.* (2015) researched and used Environmental Niche modelling to find suitable habitats for the hardground Barasingha (*Rucervus duvaucelli branderi*) and proved that the southern region of Madhya Pradesh is suitable for the sustainance of Barasingha.

In recent years, Ecotourism has been touted as a solution for the conservation and development because of its ability to protect threatened bio-diversity while providing economic growth for people living in and around protected areas. (Wells and Brandon 1992). The tourism industry has been growing rapidly with an increasing interest in nature based tourism or eco-tourism. With a rapid increase in tourism in eco-tourism, it is important to determine the impacts of ecotourism on Mammalian fauna.

Nature tourism has great potential for negative impacts on animals, as tourists seek out rare species often during sensitive times, such as breeding or nesting (Knight and Cole 1995)

Previous studies have found that tourists cause negative impacts on the movement, foraging and reproductive behaviour of various animals. When human traffic is frequent, some species withdraw, some change behaviour and still others may become habituated to human presence.

Long term studies of primates often report in increases in population size, probably due to decreased predation. (Griffins and Van shaik 1993). Ecotourism impacts may result in abnormally high or low population densities of some species in tourist areas and can possibly lead to ecological change through population increase. There also may be long term consequences on the floristic make up of an area due to altered patterns of seed dispersal and predation. These changes may have effects on the composition and functioning of the entire ecosystem.

Various studies have shown that the effects of tourists on animal densities appear to be species specific. Some population increase, some decrease. So National parks and protected areas, which are attracting number of tourists, should develop management strategies to minimize the impacts of tourists on animal population.

The diversity of wildlife in India is very rich in flora and fauna. The great wealth of wildlife can be measured with the sight of Majestic elephants, the dance of the peacock, the camel's stride and the roar of the lion. The Eco tourism development has entered an exciting phase in India. This accounts for an immense opportunity for wildlife tourism in India. In India, eco tourism has developed recently. India has attractive natural and cultural tourist attractions and it offers enormous diversity in topography, natural resources and climate. There are landlocked mountains, lush Valleys and plains white sand beaches and islands. Central India has enormous Wildlife sanctuaries with countless varieties of flora and fauna.

The most significant feature of Eco tourism industry in India is its capacity to generate large-scale employment, particularly in remote and underdeveloped areas. It offers enormous potential for utilising natural resources like landscapes, mountains, biodiversity areas, rivers etc for the benefit of people.

In India Eco tourism focuses on Indian local cultures, adventures, and environmental protection. The movement is gathering Momentum more the travel activities are taking place. The immense popularity of Eco tourism in India stems from the fact that the people are becoming increasingly conscious of the environmental hazards and the importance of the existence of diverse fauna and flora. The ecological diversity of India is arguably the most varied in the world. India has numerous rare and endangered species in its surroundings. The declaration of several wildlife areas (Eco Park at hamirgarh is one of them) and national parks

has encouraged the growth of the wildlife resources. There are numerous botanical and zoological gardens in India. There are various Wildlife Protection laws and severe punishment for poachers, hunters and illegal traders of animals and trees. There are several NGOs working for Wildlife Protection and conservation. India offers excellent options for ecotourism.

6- Research gaps identified in the proposed field of Investigation (Based on the review)

After a thorough Study and investigation of a number of literatures it was concluded that no work has been done by any scholar on neither flora nor fauna of this study area at Ecopark, Hamirgarh, Bhilwara.

7- Major Hypothesis, if any:

Assessment and conservation status of mammalian fauna so far has been carried out by normal and usual methods. After reviewing various earlier research works, some new ways and techniques may be suggested and developed for the same.

K.K. Sharma (2013) made a distinguished study and pointed out some modern tools and methods of species identification and henceforth saving millions on taxonomical studies. Also it may be assessed that ecotourism and anthropogenic pressures may adversely affect mammalian fauna, their habitats and their conservation.

8-Research Methodology:

Diversity is extensively used for monitoring and conservation of habitats. According to Usher (1986). Diversity is the most frequently adopted criterion for assessment of mammalian fauna. The following would be various means and methods for assessing and conservation of mammalian fauna at Ecopark Hamirgarh, Bhilwara. (This study shall be done in collaboration and under supervision of forest department of Bhilwara forest range in suggesting various methods and techniques to be used and implemented for assessing or sampling and conservation of mammalian fauna and their habitat.

Water hole method:

This method is the flagship method of counting mammals, being used at the study area of Ecopark, Hamirgarh along with the other methods. This is carried out on an annual basis on Buddha Purnima. A number of water holes at various locations are made ready and filled with

water. The mammals when they come to drink water from such water holes, they are being observed and counted from the nearby watch tower and data is being recorded for the number, behaviour and other characteristics.

Scan Sampling method :

This method is intended to imitate a series of instantaneous photos of the study animals, with successive photos taken at a specified time internal. Since we can't record what all the animals are doing instantaneously, the best approximation is to visually scan from one end of the study population to the other, recording what each animal is doing at the first instant that is seen.

Focal method:

This method is usually used for study of animal behaviour. In this method, a single animal shall be observed and assessed for a specified period of time. In this period either a few select behaviour or everything would be observed for the data, which would be repeated for different animals at different times.

Ad libitum (Ad-lib) method :

In this method any behaviour which shall be seen interesting or important will be recorded. In this sampling, we shall be able to record wide range of behaviour and will be able to learn what is normal or what is not. It is more useful if the population of animals when study are familiar.

Line-transect method :

This method is widely used for estimating abundance of primate populations. In this method an observer shall move along a fixed path and will count occurrence along the path and at the same time shall obtain the distance of object from path.

Roadside survey:

These survey would be made both on feet and vehicle. These are successful particularly in case of monkeys which can tolerate human presence.

Note: All these methods shall be used during early morning hours and late evening hours.

Visual encounter method (Surveys):

This method shall be used in which each zone will be randomly explored on the basis of habitat structure such as the stone, crevices of rocks, holes of trees among the shrubs or herbs. The

rodents would be caught with the help of special nets. Specimen would be then examined and data shall be recorded.

Some indirect methods (Opportunistic methods):-

Sometimes evidences such as burrows, bones, defecations etc. will be also studied because these evidences will indicate the presence of the animals.

-Villages or local people will be also contacted because they have a good enough idea about the place and a knowledge of wild life present in the Ecopark.

-Also binocular and videography will also be used for observation purposes.

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Signature of the Candidate with date

Outline Approved

05.09.2016

Name and Signature of supervisor with date & seal.

Dr. Anil Kumar Tripathi
Supervisor Research
Department of Zoology